

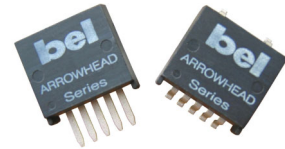
NON-ISOLATED DC/DC CONVERTERS

3.3V Input 0.9V-2.5V/3A Output

bel
POWER PRODUCTS

x7AH-03C1A0 Series

- Non-Isolated
- High Efficiency
- Low Cost
- Excellent Thermal Performance
- Input Under Voltage Lockout
- OCP/SCP
- Wide Range Trim
- Remote On/Off
- Industrial Temperature Range



Description

The Bel x7AH-03C1A0 modules are a series of non-isolated, step down DC/DC converters that operate from a nominal 3.3V source. These converters are available in a range of output voltages from 0.9V to 2.5V. It is packaged in a compact, overmolded package rated at 3A. Optional lead forming provides a vertical mount product for minimal footprint or a surface mount option for a very low profile. The output is closely regulated and the efficiency for 2.5V output is typically 93% at full load. Typical features include remote on/off, input under voltage lockout, over current protection and short circuit protection.

Part Selection

Output Voltage	Input Voltage	Max. Output Current	Max. Output Power	Typical Efficiency	Part Number Surface Mount	Part Number Vertical Mount
0.9-2.5V	3.3V	3A	7.5W	93%	S7AH-03C1A0	V7AH-03C1A0
2.5V	3.3V	3A	7.5W	93%	S7AH-03C250	V7AH-03C250
1.8V	3.3V	3A	5.4W	89%	S7AH-03C180	V7AH-03C180
1.5V	3.3V	3A	4.5W	87%	S7AH-03C150	V7AH-03C150
1.2V	3.3V	3A	3.6W	84%	S7AH-03C120	V7AH-03C120
0.9V	3.3V	3A	2.7W	81%	S7AH-03C090	V7AH-03C090

Note: Add "0" suffix at the end of the model number to indicate "Tube Packaging", and "R" for "Reel Packaging", and "G" for "Tray Packaging".

Absolute Maximum Ratings

Parameter	Min	Typ	Max	Notes
Input Voltage (continuous)	-0.3V	-	6V	
Output Enable Terminal Voltage	-0.3V	-	6V	
Ambient Temperature	-40°C	-	85°C	
Storage Temperature	-55°C	-	125°C	

Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage	3V	-	3.6V	
Input Current (no load)	-	-	110mA	
Input Current (full load)				
Vo=2.5V	-	-	3.1A	
Vo=1.8V	-	-	2.3A	
Vo=1.5V	-	-	1.9A	
Vo=1.2V	-	-	1.6A	
Vo=0.9V	-	-	1.2A	
Remote Off Input Current	-	7mA	14mA	

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Input Specifications (continued)

Parameter	Min	Typ	Max	Notes
Input Reflected Ripple Current (pk-pk)	-	50mA	100mA	With simulated source impedance of 500nH, 5Hz to 20MHz; use a 270uF/6.3V capacitor with ESR=0.03 ohm max, at 100KHz.
Input Reflected Ripple Current (RMS)	-	15mA	25mA	
I ² t Inrush Current Transient	-	0.01A ² s	0.02A ² s	
Turn on Voltage Threshold	-	2.7V	-	
Turn off Voltage Threshold	-	2.4V	-	

Note: All specifications are typical at 25°C unless otherwise stated.

Output Specifications

Parameter	Min	Typ	Max	Notes
Output Voltage Set Point				Test conditions: Vin=3.3V, Io= full load
Vo=2.5V	2.450V	2.5V	2.550V	
Vo=1.8V	1.764V	1.8V	1.836V	
Vo=1.5V	1.470V	1.5V	1.530V	
Vo=1.2V	1.176V	1.2V	1.224V	
Vo=0.9V	0.882V	0.9V	0.918V	
Line Regulation				
Vo=2.5V	-	1mV	5mV	
Vo=1.8V	-	1mV	5mV	
Vo=1.5V	-	1mV	5mV	
Vo=1.2V	-	1mV	5mV	
Vo=0.9V	-	1mV	5mV	
Load Regulation				
Vo=2.5V	-	1mV	5mV	
Vo=1.8V	-	1mV	5mV	
Vo=1.5V	-	1mV	5mV	
Vo=1.2V	-	1mV	5mV	
Vo=0.9V	-	1mV	5mV	
Regulation Over Temperature (-40°C to +85°C)				
Vo=2.5V	-	10mV	20mV	
Vo=1.8V	-	10mV	20mV	
Vo=1.5V	-	10mV	20mV	
Vo=1.2V	-	10mV	20mV	
Vo=0.9V	-	10mV	20mV	
Output Current	0A	-	3A	
Current Limit Threshold	5A	-	9A	
Short Circuit Surge Transient				
Vo=2.5V	-	0.04A ² s	0.08A ² s	
Vo=1.8V	-	0.04A ² s	0.08A ² s	
Vo=1.5V	-	0.04A ² s	0.08A ² s	
Vo=1.2V	-	0.04A ² s	0.08A ² s	
Vo=0.9V	-	0.04A ² s	0.08A ² s	

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3.3V Input 0.9V-2.5V/3A Output



Output Specifications (continued)

Parameter		Min	Typ	Max	Notes	
Ripple and Noise (RMS)	V _O =2.5V	-	10mV	20mV	Test conditions: 0-20MHz BW; 0.1uF ceramic capacitor and 10uF tantalum capacitor at the output.	
	V _O =1.8V	-	10mV	20mV		
	V _O =1.5V	-	10mV	20mV		
	V _O =1.2V	-	10mV	20mV		
	V _O =0.9V	-	10mV	20mV		
Ripple and Noise (pk-pk)	V _O =2.5V	-	45mV	70mV		
	V _O =1.8V	-	45mV	70mV		
	V _O =1.5V	-	45mV	70mV		
	V _O =1.2V	-	45mV	70mV		
	V _O =0.9V	-	45mV	70mV		
Turn on Time		-	7mS	15mS		
Overshoot at Turn on		-	0%	1%		
Output Capacitance		0uF	-	1200uF		
Transient Response						
50% ~ 100% Max Load	Overshoot	V _O =2.5V	-	100mV	130mV	Test conditions: di/dt=0.5A/us, V _{in} =3.3V, without any external capacitor at the output.
	Settling Time		-	30uS	60uS	
100% ~ 50% Max Load	Overshoot	V _O =2.5V	-	100mV	130mV	
	Settling Time		-	30uS	60uS	
50% ~ 100% Max Load	Overshoot	V _O =1.8V	-	100mV	130mV	
	Settling Time		-	30uS	60uS	
100% ~ 50% Max Load	Overshoot	V _O =1.8V	-	100mV	130mV	
	Settling Time		-	30uS	60uS	
50% ~ 100% Max Load	Overshoot	V _O =1.5V	-	90mV	120mV	
	Settling Time		-	30uS	60uS	
100% ~ 50% Max Load	Overshoot	V _O =1.5V	-	90mV	120mV	
	Settling Time		-	30uS	60uS	
50% ~ 100% Max Load	Overshoot	V _O =1.2V	-	90mV	120mV	
	Settling Time		-	30uS	60uS	
100% ~ 50% Max Load	Overshoot	V _O =1.2V	-	90mV	120mV	
	Settling Time		-	30uS	60uS	
50% ~ 100% Max Load	Overshoot	V _O =0.9V	-	90mV	120mV	
	Settling Time		-	30uS	60uS	
100% ~ 50% Max Load	Overshoot	V _O =0.9V	-	90mV	120mV	
	Settling Time		-	30uS	60uS	

Note: All specifications are typical at nominal input, full load at 25°C unless otherwise stated.

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3.3V Input 0.9V-2.5V/3A Output



General Specifications

Parameter	Min	Typ	Max	Notes
Efficiency				
Vo=2.5V	90%	93%	-	Measured at Vin=3.3V, full load and Ta=25°C
Vo=1.8V	86%	89%	-	
Vo=1.5V	84%	87%	-	
Vo=1.2V	81%	84%	-	
Vo=0.9V	78%	81%	-	
Switching Frequency	250KHz	300KHz	340KHz	
Output Trim Range (wide trim)	0	-	292%Vo	Vo=0.9V
Output Trim Range (narrow trim)				
Vo=1.2V-2.5V	90%Vo	-	110%Vo	
Vo=0.9V	-	-	110%Vo	
MTBF	3,131,719 hours			Calculated Per Bell Core TR-332 (Io = Nominal; Ta = 25°C)
Dimensions (surface mount)				
Inches (L x W x H)	0.78 x 0.70 x 0.32			
Millimeters (L x W x H)	19.81 x 17.78 x 8.13			
Dimensions (vertical)				
Inches (L x W x H)	0.70 x 0.308 x 0.65			
Millimeters (L x W x H)	17.78 x 7.82 x 16.51			
Weight	-	5g	-	

Note: All specifications are typical at 25°C unless otherwise stated.

Control Specifications

Parameter	Min	Typ	Max	Notes
Remote On/Off				
Signal Low (Unit Off)	-0.3V	-	0.3V	Remote on/off pin open, unit on.
Signal High (Unit On)	1.8V	-	3.6V	

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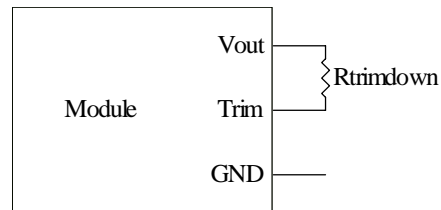
3.3V Input 0.9V-2.5V/3A Output



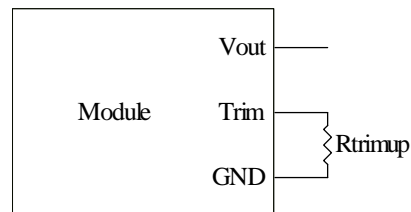
Output Trim Equations

Equations for calculating the trim resistor (in kΩ) given the desired adjusted voltage (V_{adj}) and the nominal output voltage of the converter (V_{nom}) are shown below. The Trim Down resistor should be connected between the Trim pin and V_{out} . The Trim Up resistor should be connected between the Trim pin and Ground. Only one of the resistors should be used for any given application.

$$R_{trimdown} = \frac{A}{V_{nom} - V_{adj}} - B$$



$$R_{trimup} = \frac{C}{V_{adj} - V_{nom}} - D$$



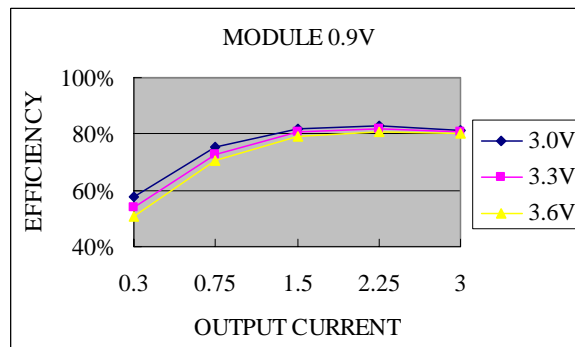
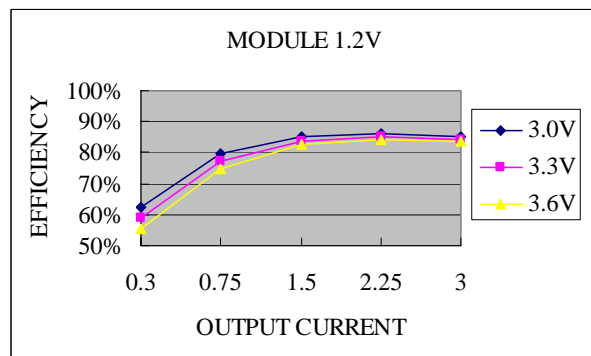
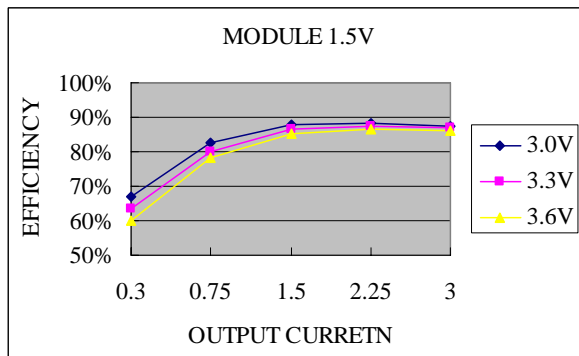
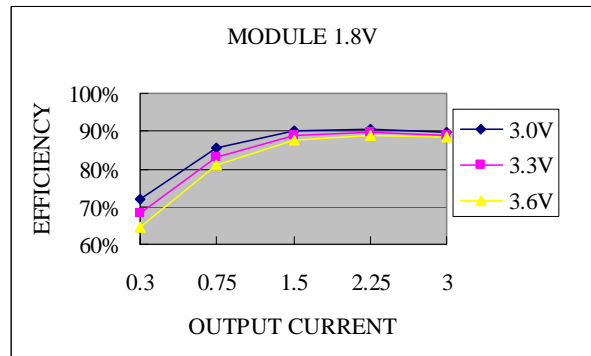
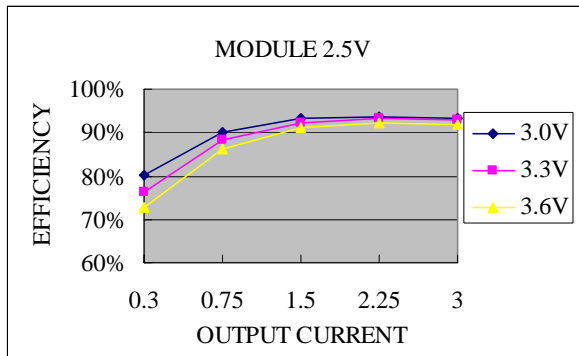
Vnom	A	B	C	D	Notes
0.9 – 2.5	N/A	N/A	3.712	1.54	Vo=0.9V when Rtrim is open
2.5	7.9117	16.14	3.712	11.5	Vo=2.505V when Rtrim is open
1.8	4.6538	20.84	3.712	16.2	Vo=1.803V when Rtrim is open
1.5	3.2633	16.14	3.712	11.5	Vo=1.503V when Rtrim is open
1.2	1.8699	11.45	3.712	6.81	Vo=1.203V when Rtrim is open
0.9	N/A	N/A	3.712	33.2	Vo=0.903V when Rtrim is open

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Efficiency Data

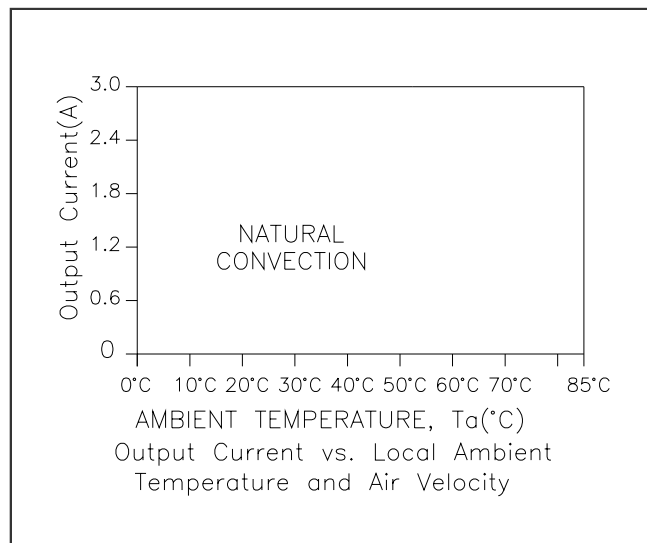


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Thermal Derating Curve

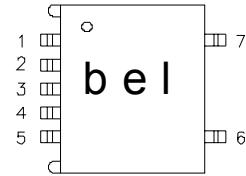
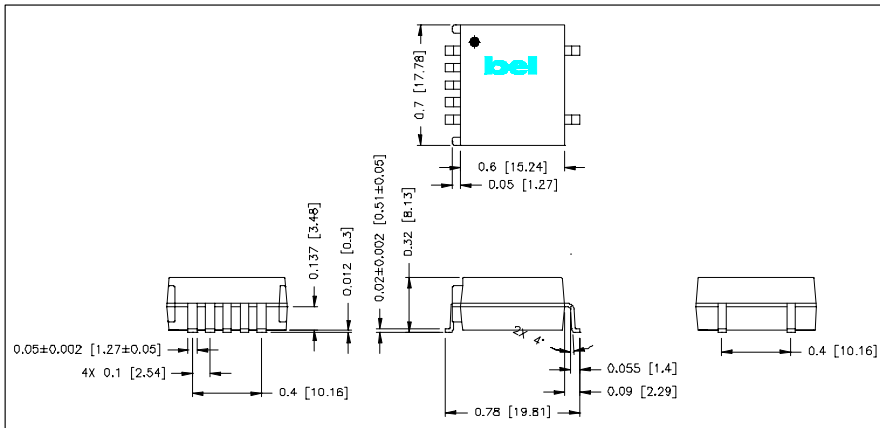


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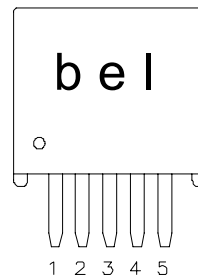
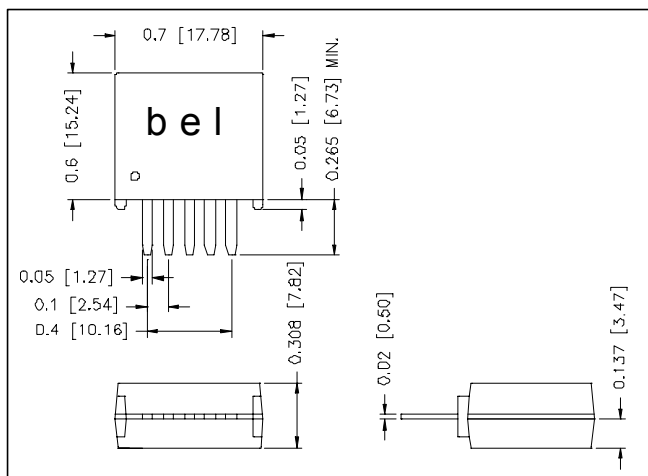
S7AH-03C1A0



Pin Connections

Pin	Function
1	Remote On/Off (option)
2	Vin
3	Ground
4	Vout
5	Trim (option)
6	N/A
7	N/A

V7AH-03C1A0



Pin

Pin	Function
1	Remote On/Off (option)
2	Vin
3	Ground
4	Vout
5	Trim (option)

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